**Title**: Lab 1: Cantilever Vibration

Author: Zach Anderson

Lab Participants:

**Object**:

1.Determine how adding mass affects the resonant frequency of a cantilever beam.

2.Complete either 2a or 2b:

a)Determine how the length of a cantilever beam affects its resonant frequency.

b)Determine how the thickness of a cantilever beam affects its resonant frequency.

**Conclusion:**

1. Adding mass to the cantilever decreases the frequency. In our tests, with the added mass, the oscillations clearly decreased. This directly correlates to the frequency. With a decrease in oscillations comes a decrease in frequency.
2. Decreasing the length of a cantilever beam increases the resonant frequency. We tested this by shortening our cantilever. It was clear that the shorter the beam got, the more oscillations per second.

**Method**:

1. Set up cantilever beam as shown in handout.
2. Set up camera to where you can record the vibration properly
3. Record cantilever specifications, the length, thickness, width, and material
4. Calibrate the system as shown in the given handout.
5. Repeat the vibration process (oscillations) with 10 different clips attached
6. Record each time

**Results**:

1. Data

The raw data is shown in the first four columns of Table 1.

1. Analysis of Data

•Describe all calculations, even if the results of those calculations are in a Table.

•Discuss the results, what they mean, and how they compare to your expectations.

•Goal of the Analysis section is to support the Conclusions.

The Number of oscillations, the frequency, and the number of clips added is shown in table 1. Also the material and the frames per second of the camera is shown. A graph of the oscillations is shown in figure 1.

The frequency and number of oscillations are related. The frequency is the numbers of oscillations per second. And every one of our “number of oscillations”, is over a span of 5 seconds so to find said frequency, we divide the number of oscillations by 5. You can clearly see that our predictions were correct when the number of oscillations decreased with the more mass added. The number of frames was calculated using the frames per second of the camera, 30. This number multiplied by 5 seconds came out to be our number of frames.

Table 1: Measured Data Oscillations with varied mass.

|  |  |  |  |
| --- | --- | --- | --- |
| **Cantilever Vibration lab - 4/21/15 - Statics** | | | |
|  | | | |
|  |  |  |  |
| Frames/Second= | | 30 | f/s |
| (Galaxy s5) | |  |  |
|  |  |  |  |
| Camera Frames/Second = frames/second,length=50cm,thickness= | | | |
| 3mm, width = 5cm, material: Sintra | | | |
| # clips added | # oscillations | # frames | Frequency = Osc/Sec = Hz |
| Example | 5 | 38 | 6.33 |
| **0** | **16** | **150** | **3.2** |
| **1** | **10** | **150** | **2** |
| **2** | **8.5** | **150** | **1.7** |
| **3** | **7.5** | **150** | **1.5** |
| **4** | **7** | **150** | **1.4** |
| **5** | **6.5** | **150** | **1.3** |
| **6** | **6.25** | **150** | **1.25** |
| **7** | **6** | **150** | **1.2** |
| **8** | **5.75** | **150** | **1.15** |
| **9** | **5.5** | **150** | **1.1** |
| **10** | **5.5** | **150** | **1.1** |
|  |  |  |  |
| Spacing between lines= | | 0.5 | in |
| Thickness= | | 0.125 | in |
| Width= | | 1.25 | in |
|  |  |  |  |
| Spacing between lines= | | 0.5 | in |
| Thickness= | | 3 | mm |
| Width= | | 5 | cm |

Figure 1: Cantilever Oscillations